immediately succeeding the Archæans" is discussed in connection with the facts that calcareous organisms are rare or not present in the formation referred to, and that calcareous rocks are abundant in the preceding systems—the Archæans. These facts are held to be in unison with the authors' conclusions stated in the last chapter, and to favour the view that the Archæan limestones with their present constitution were not available as materials for the production of calcareous rocks in the earliest Cambrian age.

(K) "The genetic difference between mineralised and methylosed metamorphism" is explained by assuming that water has been an important factor in both cases; but as the minerals in the first group are for the most part anhydrous or dry species, it is assumed that the original (? hygroscopic) water, which its members contained in their condition as sediment, was sufficient for their mineralisation; on the other hand, as the minerals composing the members of the second group are chiefly hydrous, it is contended that their methylosis has been effected by additional water penetrating them, and flowing from extraneous or foreign sources. Compared with each other, mineralised rocks may be classed as xerothermal, and methylosed as hydrothermal.

Various evidences are adduced to show that (L) "Some ophites have been originally igneous, and others sedimentary rocks"—a conclusion favouring their secondary, and consequently their methylotic origin.

(M.) "Some crystalline limestones are simply mineralised," such as carrarite; though rocks closely related to them—viz., "Dolomites have undergone methylosis." With regard to the latter, however, the authors do not accept von Buch's theory of dolomitisation in its general application. Admitting various kinds of this phenomenon, they conceive the change in certain well-known cases has been effected by the action of the magnesian constituents of sea-water on subjacent beds of limestone; for example, during the closing portion of the Triassic period, as strongly supported by geological evidences, determined by Ramsay and others, the seas in certain European regions became dried up or reduced; and their water, loaded with magnesian salts, sank through the subjacent sandstones and marls into the Permian limestones, thus converting them into dolomites. Irish corroborative cases are mentioned. The dolomites of the Tyrol are held to have originated in the same way; but it is admitted to be probable that the predazzite of the Canzacola Mountain, Val di Fassa, was dolomite that became hydrated by the heated wazer which accompanied the eruption of the immediately adjacent and overlying monzonite. "Serpentinisation effected in deposits without the intervention of mineralisation" is admitted in the production of the magneso-argillite at Vallecas, near Madrid, also of that in the Paris Basin, and other localities; for Sullivan and O'Reilly have shown that it was originally a non-magnesiàn deposit.

The authors conclude by treating of (N) "The chronogeological range of ophites, &c., and the age of their methylosis."

Offering merely possible suggestions as to the age in which this phenomenon took place in what may be regarded as the oldest ophites (as the subject is beset with considerable difficulties), instances referable to secondary periods, as the dolomites and serpentine rocks of the Tyrol, &c., are briefly noticed; but they refer more confidently to the methylosed euphotides, &c., of Northern and Central Italy, which, having burst through cretaceous limestone (alberese), eocene sandstones and schists, have incontestably produced gabbro verde during late tertiary ages. Moreover, it would appear from the discoveries of Achiardi, that argillaceous schists, in Tuscany, are now being serpentinised by the action of magnesiated water. And, taking the wide range of evidences which have been adduced into consideration, it can scarcely be doubted that the same process is still in operation in deep-seated rocks, permeated by heated waters.

SCIENTIFIC SERIALS

Annalen der Physik und Chemie, No. 2.—On the course of formation of residual charge in Leyden jars, with constant difference of potential of the coatings, by W. Giese.—On a relation between pressure, temperature, and density of the saturated vapours of water and some other liquids, by A. Winkelmann.—On Newton's dust-rings, by K. Exner.—Remarks on the electrodynamic fundamental laws of Clausius, Riemann, and Weber, by J. Fröhlich.—General theory of the damping exercised by a multiplier on a magnet, by K. Schering.—Chemical monography of the mica group, by C. Rammelsberg.—Modulus of elasticity of ice, by L. Reusch.—The cross-pendulum, an apparatus for graphic representation of curves of vibration, by P. Schönemann.

Gegenbaur's Morphologisches Jahrbuch, vol. vi. part 1, 1880.—A. Rauber, continuation of first section of his treatise on transformations and their causes in the development of vertebrata (pp. 1-48).—G. Born, postscript to former papers on the carpus and tarsus in amphibia and reptiles, plate 1 (pp. 49-78).—W. Geisbrecht, histology of teeth in echinoids, plates 2-5 (pp. 79-105).—Leo Gerlach, a case of tail-formation in a human embryo, with careful histological drawings, showing an indubitable notochord, plate 6 (pp. 106-124).—M. von Davidoff, on the skeleton of the hind-limbs of holostean ganoids and physostomous teleosteans.

THE *Bulletin de l'Académie Royale des Sciences de Belgique*, No. 12, 1879.—On the variations of the specific heat of carbonic acid at high temperatures, by M. Valerius.—Red spot observed on the planet Jupiter during the oppositions of 1878 and 1879, by M. Niesten.—Denominations given to the spots of the planet Mars, by M. Terby.—Method for determining all the ordinary singularities of a locus defined by k algebraic equations containing $k - 1$ arbitrary parameters, by M. Saltel.—The classification of birds since Linnæus, by M. de Selys Longchamps.—The development of the vegetable kingdom in geological times, by M. Gilkinet.—Jury report on the sixth period of quinquennial competition in the mathematical and physical sciences.

No. 1, 1880.—Existence of a double apparatus and of two sanguineous liquids in Arthropoda, by M. van Beneden (sealed packet).—Remarks on the existence of evolution in curves of the third order and fourth class, by Prof. Weyr.—Description of an isochronous elliptic governor, the speed of whose action can be varied at will, by M. van Rysselberghe.

Archives des Sciences physiques et naturelles, February 15.—Swiss geological review for 1879, by M. E. Favre.—On the time required for surveys of the heavens made with different magnifying powers of the telescope, by M. Thury.—On the constitution of naphtaline and of its derivatives, by MM. Reverdin and Nölting.—Directive ideas for the history of the vegetable kingdom since the tertiary epoch, by Dr. Engler.—Variations of the magnetic declination deduced from regular observations at Moncalieri, in the period 1870-71, by Père Denza.—A series of researches on the pelagic fauna of the lakes of Tessin and of Italy, by Dr. Pavesi.

Reale Istituto Lombardo di Scienze e Lettere, Rendiconti, vol. xiii. fasc. i.—The *mal nero* and the phylloxera at Valmodiera, by S. Trevisan.—Congenital syphilis by direct paternal influence, &c., by Prof. Scarenzio.—On new facts proving the ability of ascarides to perforate unaltered membranes within the abdomen, by Prof. Sangalli.—Contribution to the histology of the voluntary muscles, by Prof. Golgi.

Cosmos, February.—Prof. Dr. Fritz Schultze, on the history of the origin of the conception of soul.—Dr. C. Forsyth Major, on quaternary horses (translated from *Archivio per l'Antropologia*, 1879), A. W. Buckland.

THE *Atti della R. Accademia dei Lincei*, January.—On the chemical composition of the soil of the serpentine of Tuscany, by S. Cossa.—On the cranium of a crocodile discovered in the eocene strata of Veronese, by Baron de Zigno.—Revindication on some correlations between the thermal and other physical properties of bodies, by S. Cantoni.

THE *Revue Internationale des Sciences biologiques*, February.—M. Vulpian, physiological study of poisons, No. 3.—On jaborandi (conclusion).—M. Debierre, on the origin and the evolution of societies, and of the civilisation following contemporary science. Notices of scientific works; scientific societies; book notices.

SOCIETIES AND ACADEMIES

LONDON

Linnean Society, March 18.—Prof. Allman, F.R.S., president, in the chair.—The President said that before entering on the ordinary business of the meeting it became his melancholy duty to announce the death of Prof. Thos. Bell at the age of eighty-seven. Prof. Bell was the oldest Fellow of the Society, having been elected into it in the year 1815. He had held the presidential chair for many years, and under his judicious and able guidance the Society had marvellously advanced in prosperity.

He was a distinguished zoologist, and by his researches had largely advanced our knowledge of the fauna of the British Isles. His labours have left their mark on the zoology of Britain, and it is hard to say who can take his place in the department of natural history, in which he had shown himself so loving and conscientious an observer. He was known personally to many here present, and by reputation to all of us, and the meeting will receive with sorrow the sad announcement that he has his place no longer among the Fellows.—Mr. Thos. Christy exhibited a collection of dried flowers from Western Australia, made by Mrs. Bunbury. She observes that the once common native flowers are becoming rapidly scarce in the pasture land of the colony, and that it is even difficult to propagate them by culture.—There was also shown for Mr. J. T. Carrington a male and female example of the Northern Stone Crab (*Lithodes arctica*), which had lived in the Westminster Aquarium. The peculiar asymmetry of the abdominal segments in the female was adverted to, and from this and other reasons an affinity with the Hermit Crabs pointed out.—The Secretary read a communication from Mr. H. M. Brewer, of Wanganui Acclimatisation Society, on the indigenous timber and on plants introduced into New Zealand. Among the former, "Manaka" (*Leptospermum ericoides*) is useful for spokes, tool handles, &c.; "Korohai" (*Sophora tetraptera*) forms admirable material for carving, &c.; "Totara" (*Podocarpa totara*) is most durable for piles, railway sleepers, &c.; red birch (*Fagus fusca*), on account of its strength, is well adapted for beams and framework; and the "Matai" (*P. spicata*) is so durable that a prostrate tree found in damp bush and supposed to have lain there for a couple of centuries still retained its soundness when cut up. Of plants introduced quite a host thrive out of doors. Among others the coral tree (*Erythrina caffra*), with its brilliant scarlet flowers. *Fourcroyia gigantea*, which produces a fine fibre and grows well without any cultivation on the waste clay hills; also *F. flavoviridis*, another fibre-yielding plant. *Chamærops excelsa*, *C. humilis*, *Musa textilis*, and *M. sapientum*, equally thrive, the banana ripening good fruit. *Broussonetia papyrifera*, from which paper is made in Japan. The pomegranate (*Punica granatum*) and the olive (*Olea europœa*) hereafter are likely to become important as commercial products. The Natal plum (*Arduina grandiflora*), the fig (*Ficus carica*), custard-apple (*Anona muricata*), *Eriobotrya japonica*, ginger (*Zingiber officinalis*), the tallow tree (*Stillingia sebifera*), cinnamon, camphor, orange, lemon, and citrons, besides many other sub-tropical plants, afford sufficient proof of the mildness of the climate and capabilities of the country ultimately to depend on its own resources. Of araucarias and pines a great number of introduced species have thriven well, some only requiring a little shelter at first. Oaks, elms, poplars, &c., all take naturally to the New Zealand soil, but sufficient has been said to indicate the great variety of flora indigenous and introduced into this flourishing though distant colony.—A paper by Prof. J. O. Westwood, on a supposed polymorphic butterfly from India, was also read by the Secretary for the author. The conclusions arrived at are: (1) of *Papilio Castor* being males of a species whose females have not yet been discovered; (2) that the typical *P. Pollux* are females of which the male with rounded hind wings having a diffused row of markings has yet to be discovered; and (3) that the coloured figures given by the author represent the two sexes of a dimorphic form of the species.

Physical Society, March 14.—Dr. Huggins in the chair.—New members—Prof. Minchin, Mr. Hulme, Mr. A. Stroh, Prof. D. E. Hughes, Lieut. Wingfield, Mr. J. Macfarlane Gray. Mr. W. Chandler Roberts, F.R.S., drew attention to an explanation which has recently been suggested by Dr. Van Riemsdijk of Utrecht to account for the "flashing" which attends the solidification of cupelled buttons of gold and silver. He showed experimentally that at the point of solidification the metals emit a flash of greenish light, which Dr. Riemsdijk thinks is probably due to the globules being really in what is known as the superfused or surfused state; that is they fall some degrees below their points of solidification without setting, and the change from the liquid state is accompanied by the liberation of the latent heat of fusion, which again heats the globule and renders it incandescent. In an attempt to obtain inductions as to the state of certain fused metals by the aid of the induction balance, Mr. Roberts was able to show that the resistance of silver in the molten state is far greater than when the metal is solid, and on the other hand he had confirmed De La Rue's statement that the resistance of molten bismuth is less than that of the solid metal, and he also obtained evidence that bismuth in cooling may be made to pass through a superfused state similar to that which occurs in the buttons of gold. Mr. N. Lockyer thought the greenish tint of the light might be due to a solid film on the surface of the globule.—The Secretary then read a paper by Prof. W. F. Barrett, announcing that he had found a current of electricity to be generated by the rotation of the prepared chalk cylinder in the receiver of the Edison telephone. When the platinum stylus which rubs on the cylinder is connected through a galvanometer to the brass axle on which the cylinder is mounted, a current is observed whose E.M.F. is over $\frac{1}{3}$ volt. This current falls off as the rotation continues, owing, Prof. Barrett assumes, to the electrification of the surface of the chalk. Prof. Barrett attributes the current to friction solely, and seeks to account for the receiving action of Edison's telephone by this frictional current being modified by the transmitted currents, and not by the electrolytic action to which it is usually ascribed. These experiments originated with a suggestion of Prof. Sylvanus Thompson that the Edison receiver might act as a transmitter. Prof. Barrett had at length succeeded in making it act in this capacity by means of the frictional current.—Mr. Shelford Bidwell exhibited some experiments bearing on Prof. Barrett's observations, which tended to show that the source of the current in the Edison receiver was due to the fact that a voltaic element is formed by the platinum rubbing point, the brass axle, and the prepared chalk. This chalk is usually impregnated with phosphate of soda, or, as in the author's experiments, with caustic potash and acetate of mercury. The cylinder seems to be dry, but is probably moist; wetting it greatly increases the current. There is a very feeble current when no motion of the cylinder takes place, but rotation of the cylinder greatly increases it. Platinum is electro-negative to brass, and hence the positive current flows from the platinum to the brass through the galvanometer. This was demonstrated by substituting zinc for platinum, when the current was reversed and flowed from the brass to the zinc, owing to the fact that brass is electro-negative to zinc. Mr. Bidwell showed, by means of a simple pile of copper and tin foil separated by a moist cloth or paper, that the motion of the tin across the paper increased the current of the cell. In the case of a cell made of *two* tin plates separated by moist paper, the current was set up by moving one plate over the other. The plate which moved relatively to the paper was always electro-negative to the other. Mr. Bidwell also showed by a simple experiment that the action of Edison's receiver was electrolytic. He caused the mere passage of a current to lessen the friction of a metal strap on a drum covered with moist paper, and thereby released the drum by the evolution of hydrogen. Prof. Ayrton pointed out that the rubbing action in these experiments assisted the current by bringing up fresh electrolytic matter, a fact which had been taken advantage of in the construction of several batteries. Prof. Adams remarked that this action did not seem to explain how the current was *reversed* in the cell composed of *two* tinfoil plates.—Prof. Guthrie then demonstrated by experiment a curious anomaly in frictional electricity. When flannel is rubbed with ebonite the flannel is + electrified; when ebonite is rubbed with glass the ebonite is + electrified; and we should therefore expect that when flannel is rubbed with glass the flannel would be still more + electrified; but instead of that it is really feebly negative. Perhaps the fact that the heat of friction enters into one substance more than the other affected such results.—The Secretary then read a note from Mr. Ridout, stating that he had succeeded in Dr. Guthrie's funnel experiment mentioned at last meeting, and by means of a stream of water flowing out of a glass funnel had attracted a glass cone towards the mouth of the funnel. The angle of the cone was greater than the angle of the funnel.

Victoria Institute, March 11.—Prof. Hughes, of Cambridge, read a paper upon the movements of elevation and depression in the British Isles, in which he continued his argument against the existence of preglacial man.

EDINBURGH

Royal Society, March 1.—Prof. Geikie in the chair.—Sir William Thomson communicated to the Society his new method for measuring temperatures by means of "steam-pressure thermometers of sulphurous acid, water, and mercury"—a method which will be found fully described in the article "Heat," in the forthcoming volume of the "Encyclopædia Britannica." The system here proposed is essentially a *manometric* one as opposed to the ordinary *volumetric* one. Any given

temperature is definitely measured by the pressure exerted by the *steam* of a convenient liquid which is kept at the required temperature, where by steam is meant vapour in presence of its liquid. The range of temperature through which sulphurous acid can be so employed, with a moderate column of mercury (the *manometric column*) to measure by its height the pressure exerted, is from $-40°$ C. to $+20°$ C. Below this inferior limit carbonic acid may be substituted, and above the superior limit water is eminently suitable, and can be made to stand a temperature of 140° C. For still higher temperatures the steam pressure mercury thermometer is required, a water manometric column being used for temperatures below 280°, and a mercury manometric column for temperatures above that limit and below 520°. The water manometric column is necessary for the lower range, so as to give the thermometer sufficient sensibility for registering small increments of temperature throughout that range. A sulphurous acid cryophorus was also exhibited, its structure being the same as the differential steam-pressure sulphurous acid thermometer, which is simply a U-tube closed at both ends and filled with sulphurous acid in the liquid and gaseous states. This instrument was the type upon which the steam-pressure water thermometer and the steam-pressure mercury thermometer for the highest range were constructed.—Sir W. Thomson also communicated a paper on the vibrations of a columnar vortex, in which he proved that the velocity of propagation of a longitudinal wave along an infinitely long vortex column was about one-third the velocity of the surface of the column in its undisturbed state. He also discussed the case of transverse vibrations, and pointed out the importance of such investigations as probably throwing some light upon the nature of the sudden gusts which accompany great storms.—Prof. Turner read a paper on the structure of the comb-like appendages and teeth of the basking shark. These comb-like appendages, though differing remarkably in many ways from whale-bone, seemed to serve a very similar function.—Sir Wyville Thomson communicated a preliminary report, by Mr. Herdman, on the *Ascidiæ* of the *Challenger* Expedition, from which it appeared that of the sixteen new species discovered by the *Challenger*, only two had been previously known.—Prof. Tait laid before the Society a few notes regarding his application of rotatory polarisation to the determination of the position of bright lines in feeble spectra.

Boston, U.S.A.

American Academy of Arts and Sciences, March 10.—Charles Francis Adams in the chair.—Prof. Edward C. Pickering read a paper on Huggins's recent photographs of the spectra of stars, and gave a formula based on the molecular constitution of matter, which apparently explained the peculiar grouping of lines observed by Huggins.—Mr. Albert A. Michelson, of the United States Navy, explained a plan for obtaining the velocity of the solar system through space. He proposes to measure the velocity of light by a method which obviates the necessity of having the ray of light pass back and forth over the same path, and by the employment of the revolving mirrors, which are maintained at the same speed of revolution, the velocity of light can be obtained in the direction of the movement of the earth through space and in the opposite direction. Mr. Michelson is about to undertake experiments to determine the question of the movement of the solar system.—Prof. J. P. Cooke, of Harvard University, gave the results of various methods which have fully confirmed his value obtained for the atomic weight of antimony.

Paris

Academy of Sciences, March 22.—M. Ed. Becquerel in the chair.—The following papers were read:—On the origin of the solar system, by M. Faye.—On some applications of elliptic functions, by M. Hermite.—On the compensation of temperatures in chronometers, by Mr. Phillips.—On the tritoxide of silver, by M. Berthelot.—Observations on the decomposition of permanganate of potash by oxygenated water, by M. Berthelot. He is led to the hypothesis of a tritoxide of hydrogen (HO_3) resulting from oxidation of oxygenated water by the permanganate.—On electric regulation of the hour in Paris, by M. Tresca. The system comprises (1) a certain number of horary centres distributed on two telegraphic systems; they are good clocks, with action regularised every second; (2) the clocks of the town kept in their present state, but true in time. Of the former, six have been in action since January 3; and six others, on a distinct system, are to be set up.—Report to the Academy on the results obtained during the voyage of the *Magicienne*, for observation of the transit of Mercury, by Admiral Serres. This includes information about transport of time, differences of longitude in South America, observations on magnetism, measurement of the force and direction of winds, the transit of Mercury, description of an electric log, &c.—On the curves defined by a differential equation, by M. Poincaré.—On the integrals of algebraic functions, by M. Pellet.—On a class of functions of several variables drawn from inversion of integrals of solutions of linear differential equations, the coefficients of which are rational functions, by M. Fuchs.—Analysis of luminous phenomena produced by electric discharges in rarefied gases, by M. Fernet. The discharges in a large vertical tube were viewed by reflection in a rotating mirror behind a slit in a screen. The peculiar appearances of the bright curves occurring between the poles is described.—On the thermal laws of electric sparks produced by ordinary, incomplete, and partial discharges of condensers, by M. Villari.—On a case of remanent polarity of steel opposite to that of the magnetising helix which produces it, by M. Righi. Theory led him to believe that with a series of bars of the same steel and diameter, but decreasing lengths, a certain length would be reached which would not give magnetisation, while, with less length, a remanent polarity would be got, opposite to that of the coil. He states how he realised the latter.—On the photography of the solar spectrum, by M. Conche. His method is long exposure of bromised gelatine plates.—On the density of iodine at high temperatures, by MM. Crafts and Meyer.—On a mode of production of acetal, by MM. Engel and Girard.—Specific heats of solutions of potash and of soda, by M. Hemmerl.—On the alkalies of pomegranate, by M. Tanret.—Artificial production of a leucotephrite identical with the crystalline lavas of Vesuvius and La Somma; nascent crystalline forms of leucite and nepheline, by MM. Fouqué and Levy.—Artificial reproduction of spinel and corundum, by M. Meunier. Chloride of aluminium, steam, and metallic magnesium (or zinc) were brought together in a heated tube.—On the normal presence of copper in plants which live on rocks of the primordial formation, by M. Dieulafait.—Researches on the vaso-motor innervation, the circulation of the liver and of the abdominal muscles, by M. Laffont.—On the anatomical character of the blood in phlegmasias, by M. Hayem.—On the godrooned cells of the intravaginal hyaline system of the nerves of Solipedes, by M. Renant.—On the nervous system of *Idothea entomon* (an isopod crustacean), by M. Brandt.—On the caducity of the hooks, and even of the scolex in Tænias, by M. Mégnin.—M. Larrey presented, from M. da Cunha Bellem, a Portuguese work, entitled "Medical Life on the Battle-field," and gave an analysis of it.

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